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of the gymnosperms and angiosperms contains a few illustrations from articles by CHAMBERLAIN and Miss PACE which had been published in the BOTANICAL GAZETTE. The articles on paleobotany were first written by POTONIÉ, after whose death they were revised by KUBART in Graz. In these articles the work of SEWARD is never mentioned, and SCOTT is hardly considered. The articles on plant genetics are more up-to-date, and best of all are those on physiology and anatomy.

The lack of knowledge with regard to American and English botanical literature is very pronounced in many German publications. The geologists in Germany know more English because they have to read the publications of the U.S. Geological Survey.—A. C. NOÉ.

**Origin and development of Compositae.**—SMALL[3] has assembled in book form his papers on the origin and development of the Compositae, which appeared in the *New Phytologist* during 1917-1919. It is an application of our knowledge of evolution, heredity, and geographical distribution to the immense amount of material presented by this great family. This study has been carried on for ten years, and "in so far as success has been achieved in the unravelling of the tangled skein of descent of this particularly large group of angiosperms, it is due to the recognition of new criteria and the critical revision of the old criteria."—J. M. C.

**Joseph Dalton Hooker.**—BOWER[4] has written a most interesting account of Sir JOSEPH DALTON HOOKER for the series of booklets issued by the "Society for Promoting Christian Knowledge," under the general title "Pioneers of Progress," and the subtitle "Men of Science." The titles of the brief chapters suggest the contents: Birth and education; Foreign travel; Kew; Authorship; The species question; Personal characteristics; Hooker's position as a man of science. The author and his style form a combination that insures authoritative statements and interesting presentation.—J. M. C.

**Flowering plants and ferns.**—Under this title WILLIS published the first edition of his manual and dictionary in 1897. A second edition appeared in 1904, a third in 1908, and now a fourth edition has been published.[5] The purpose is to supply a convenient summary of information about plants, and the result is a very convenient book of reference. The most noteworthy feature of the present edition is the incorporation of all the parts of the earlier editions into one general dictionary, and the omission of the former part dealing with morphology, classification, geographical distribution, economic uses, etc. There are approximately 20,000 entries, so that a wealth of information is available at a minimum of trouble.—J. M. C.

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[3] SMALL, JAMES, The origin and development of the Compositae. pp. xi+334. *pls. 6.* London: William Wesley & Son. 1919.

[4] BOWER, F. O., Joseph Dalton Hooker. pp. 57. New York: Macmillan Co. 1919.

[5] WILLIS, J. C., A dictionary of the flowering plants and ferns. Fourth edition. pp. xii+712+liv. Cambridge: The University Press. 1919. New York: G. P. Putnam's Sons.

## NOTES FOR STUDENTS

**Tropical rain forests.**—Two recent contributions have added considerably to our knowledge of the ecology of tropical rain forests, especially as both present quantitative data concerning habitat and also the vegetation. The first by BROWN[6] deals with the vegetation of a portion of the Philippine Islands, and the second by MCLEAN[7] with some of the rain forest near Rio de Janeiro, Brazil, and is the continuation of a report already noticed.[8] This rain forest of Brazil is regarded as the climax type for a large portion of the country. A biological spectrum of the Raunkiaer type would show an enormous preponderance of woody plants arranged in three distinct strata, the ground flora being comparatively open. There is a great diversity of species, with the Leguminosae as the most prominent family, and the Rubiaceae and Piperaceae important among the undershrubs. Ferns and lycopods are largely limited to rocky spots. Conspicuous flowers are abundant in the upper canopy and notably lacking below. Buttressed tree trunks are rare, in spite of the frequency of violent winds, but thorny stems are frequent even in large trees. The floristic diversity and the contrasting uniformity of appearance, especially in leaf form, are ascribed to (1) the antiquity of prevailing conditions, and (2) the peculiarity of the environment. The soil is shallow and pervious, with a water-holding capacity of about 40 per cent, and an average water content of 10 per cent. It is deficient in mineral nutrient material and particularly in calcium carbonate. The humus content is about 3 per cent. *Mycorhiza* are very abundant. A very considerable amount of rain is intercepted by foliage and evaporated into the air, thus reducing the rainfall efficiency. Light measurements made with photographic exposure meters show the average ratio of the light outside and that within the deep forest to be 1:0.06; some spectroscopic measurements, however, tend to show that the photosynthetic efficiency of the shade illumination is relatively greater than the actinic.

The leaves of the forest are in general characterized by their larger size, the small number per plant, and the frequency of nyctitropic movements and of the vertical position. The shade leaves show conspicuous water-storing epidermis, reduced and undifferentiated mesophyll, and occasional epidermal

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[6] BROWN, W. H., Vegetation of the Philippine Mountains. Dept. Agric. and Nat. Resources, Bur. Sci. Pub. **13**:434. *pls. 41. figs. 30.* Manila. 1919.

[7] MCLEAN, R. C., Studies in the ecology of tropical rain forest; with special reference to the forests of South Brazil. Jour. Ecol. **7**:121–172. *figs. 10.* 1919.

[8] BOT. GAZ. **69**:92–94. 1920.